Can Automated Responses to Cyber Incidents be supported by Artificial Intelligence?

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Outline

- Motivation(s)
- Log files
- Security Information and Event Management (SIEM)
- Security Orchestration, Automation, and Response (SOAR)
- Manual labelling for AI Integration
- Incident descriptions
- Generation of the incident description as a vector
- Conclusions

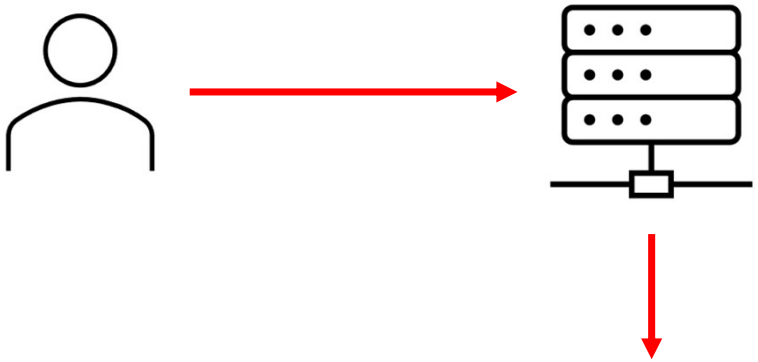
Motivation 1: False Positives

- Problem of **False Positives** (FP) in Machine Learning
- Cyber incidents which are **misclassified**
- **Increases the costs** in the company (more working hours)
- Examples:
  - User login after failed attempts
  - Unauthorized access which does not compromise the system or steal data

Motivation 2: Cyber Taxonomy

- **NIS2** (EU Directive 2022/2555, D.Lgs. n.138/2024)
- Starting from January 2026: communication of cyber incidents with a significant impact to the **Computer Security Incident Response Team** (CSIRT)
- The **Agenzia per la Cybersicurezza Nazionale** (ACN) defines a taxonomy (**TC-ACN**) for incident notifications:
  4 macrocategories, 22 predicates, 144 values

Log Generation in Network Devices

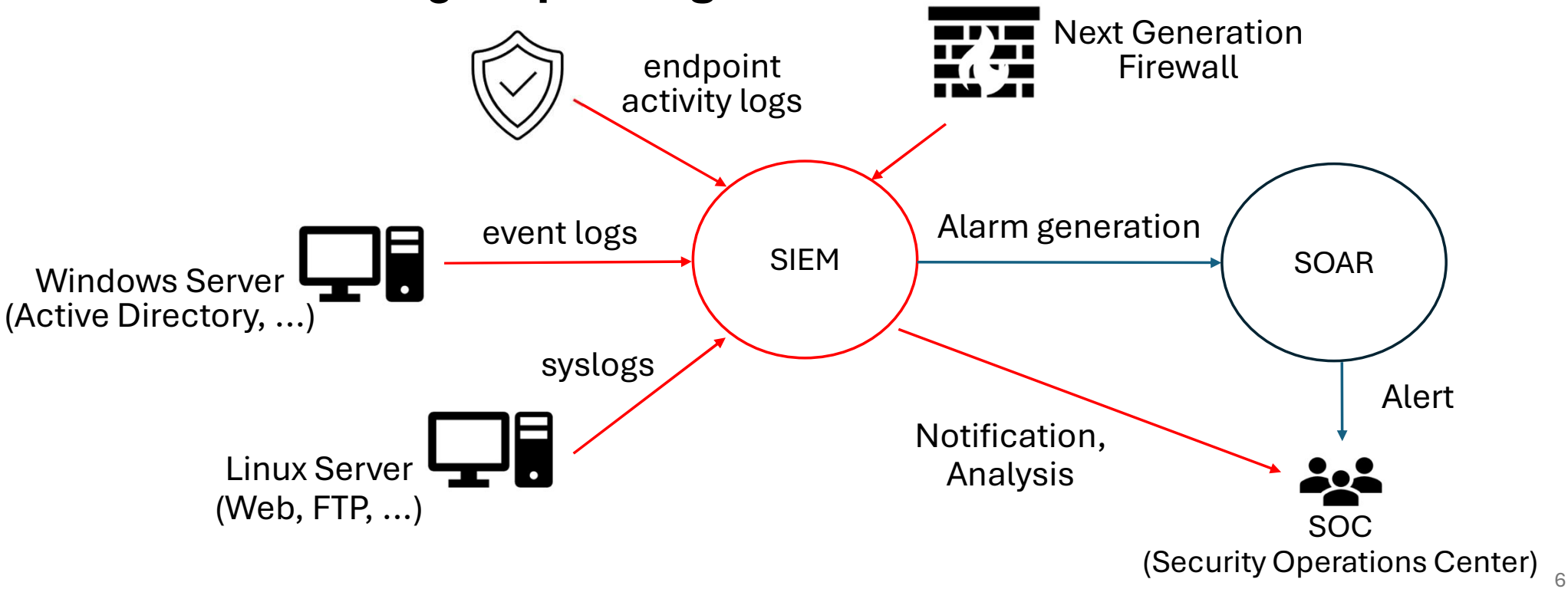


Überwachung erfolgreich	02.11.2025 11:34:59	4611	Security System Extension
Überwachung gescheitert	02.11.2025 11:34:59	4625	Logon
Überwachung erfolgreich	02.11.2025 11:34:59	5059	Other System Events
Überwachung erfolgreich	02.11.2025 11:34:59	5059	Other System Events
Überwachung erfolgreich	02.11.2025 11:34:59	4611	Security System Extension

SIEM

Security Information and Event Managament:

Collection of logs + **parsing**



SIEM solutions

Splunk Enterprise Security

Microsoft Sentinel

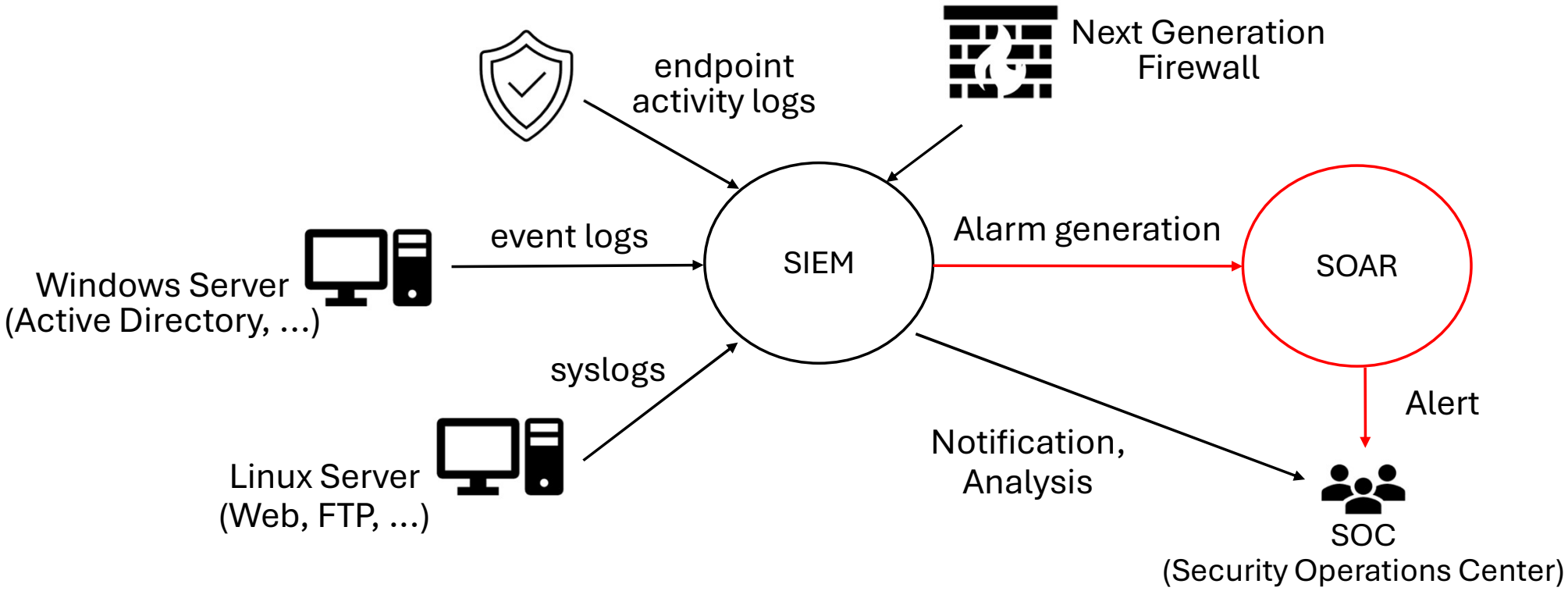
IBM QRadar

Elastic Security

Open source solutions (Elastic Stack, OSSIM, OSSEC, …)

SOAR

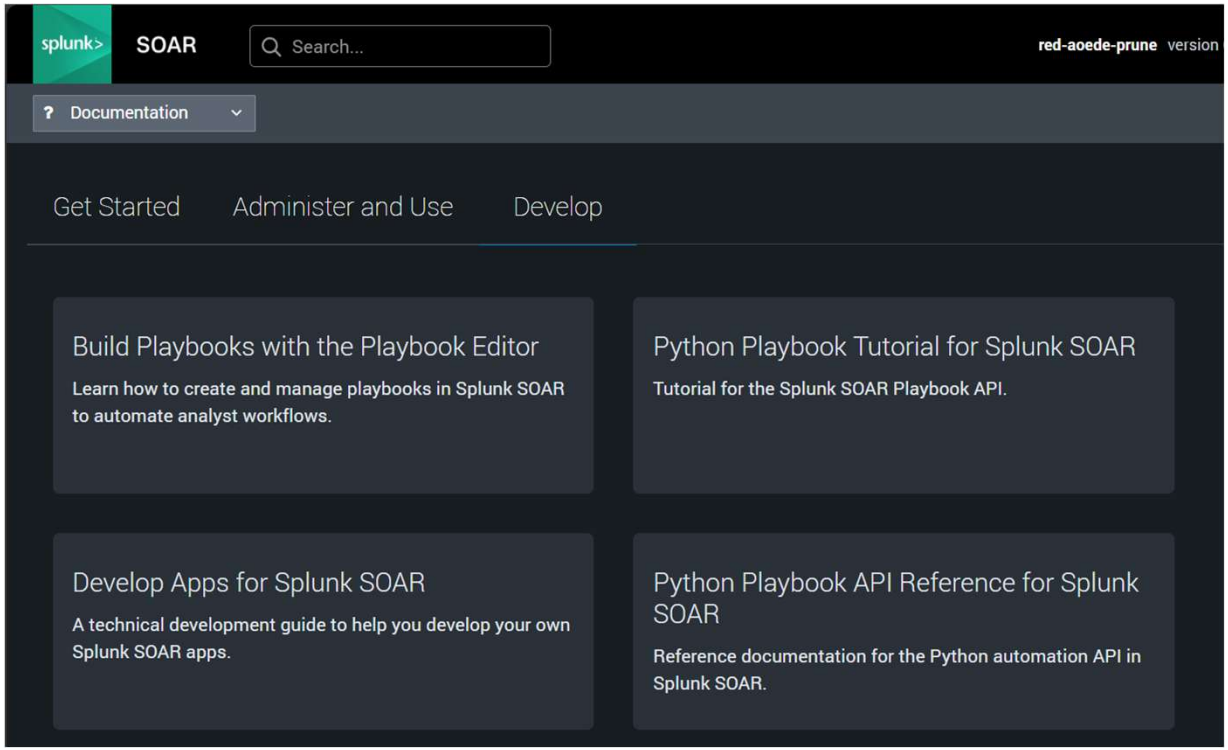
Security Orchestration, Automation, and Response:



Splunk SOAR

Setup:

- On-premises installation
- Free Community Edition
- Phantom Community Playbooks (Apache-2.0 license)

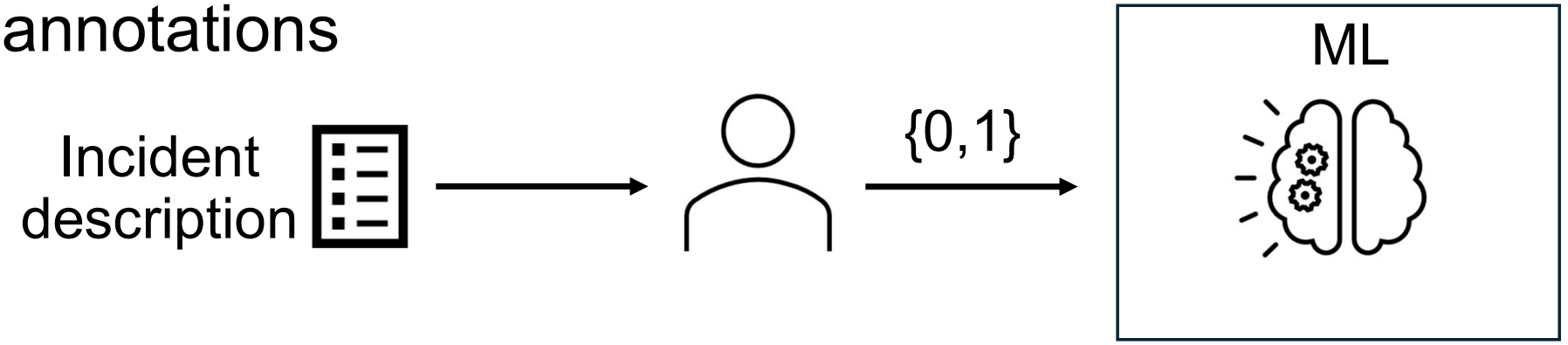


https://www.splunk.com/en_us/download/soar-free-trial.html

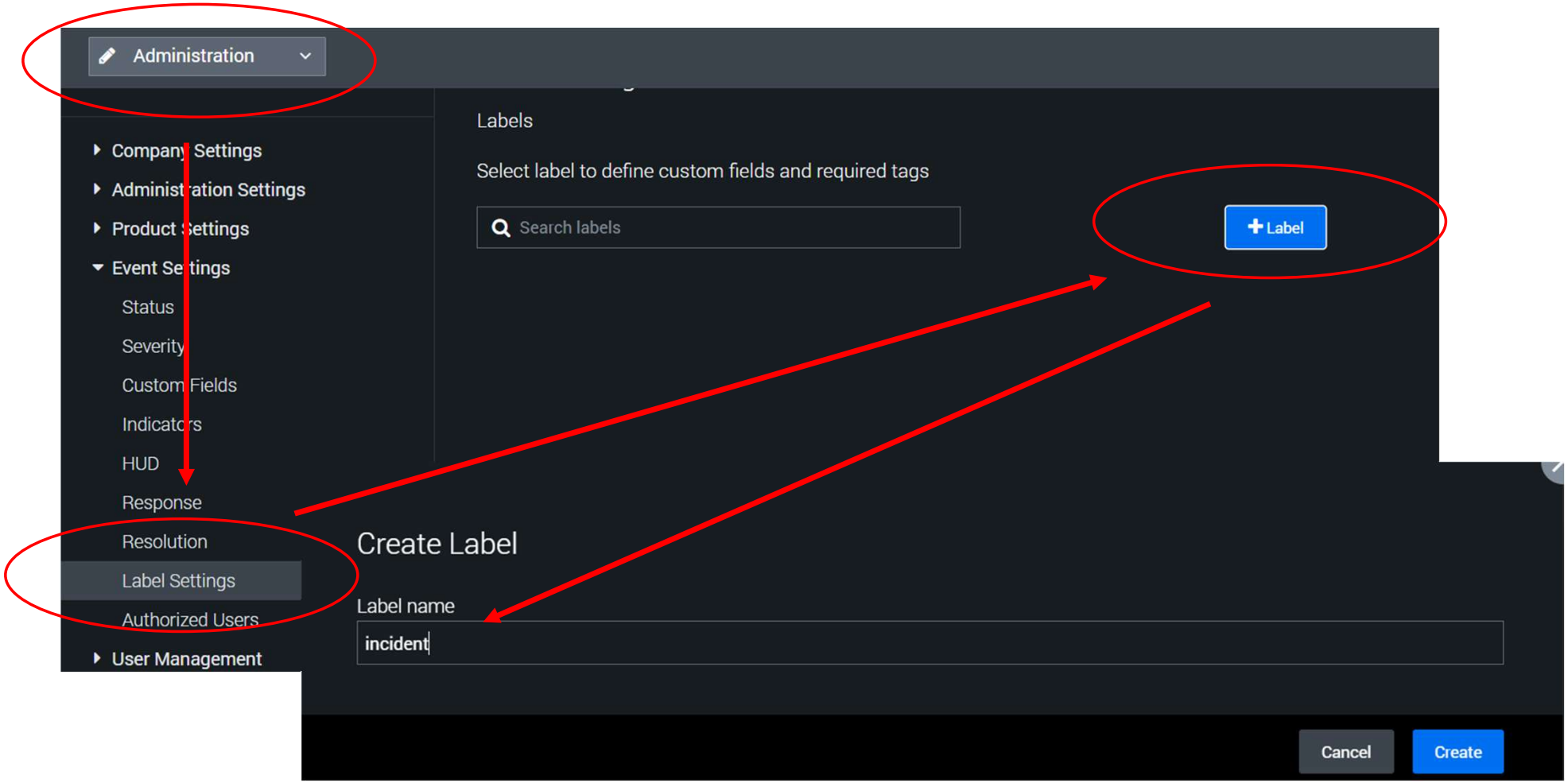
How to reduce the FP

Methodology

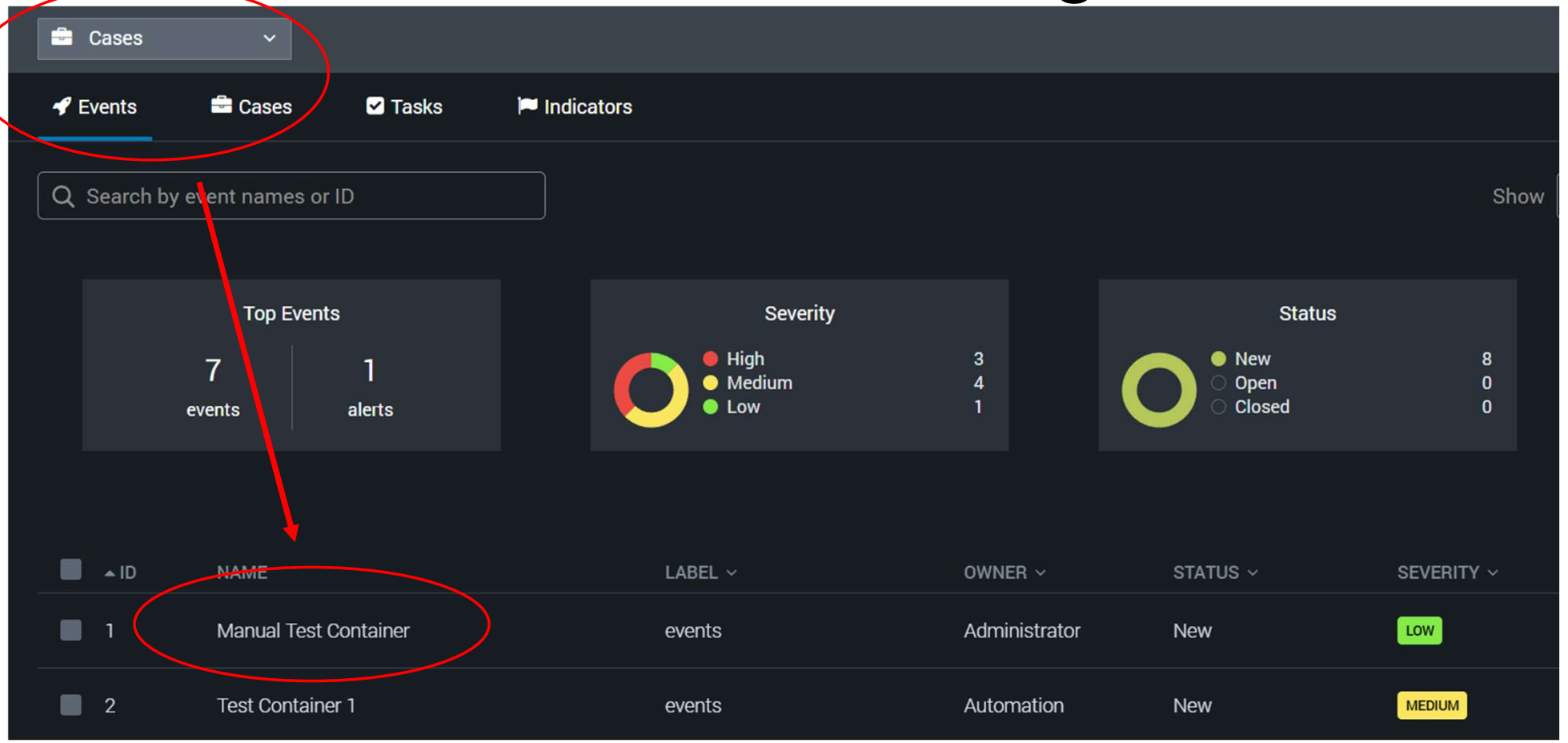
- Manual labelling → Ground Truth
- Training a Machine Learning (ML) model
- Continual Learning through human annotations



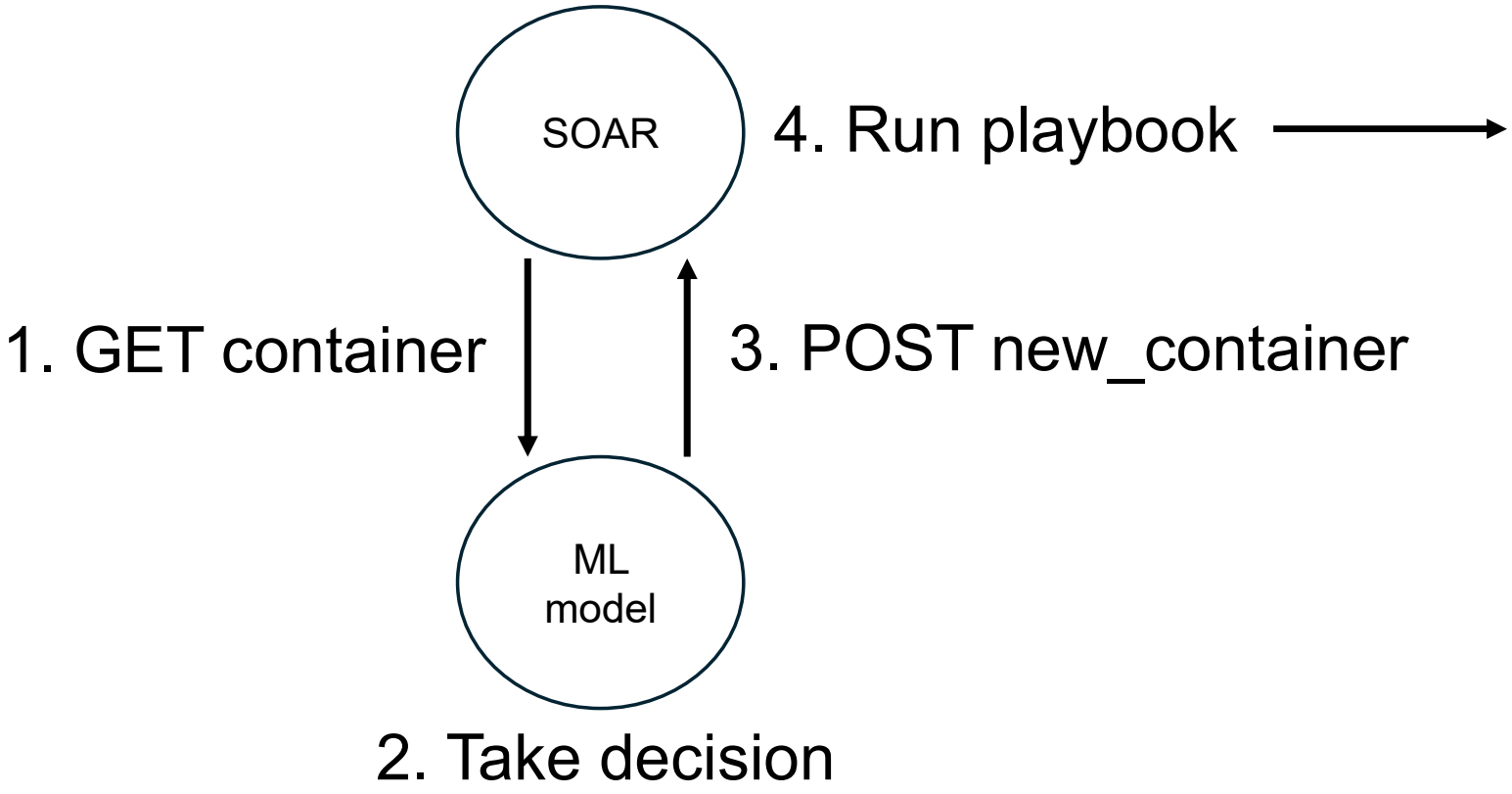
Create new label



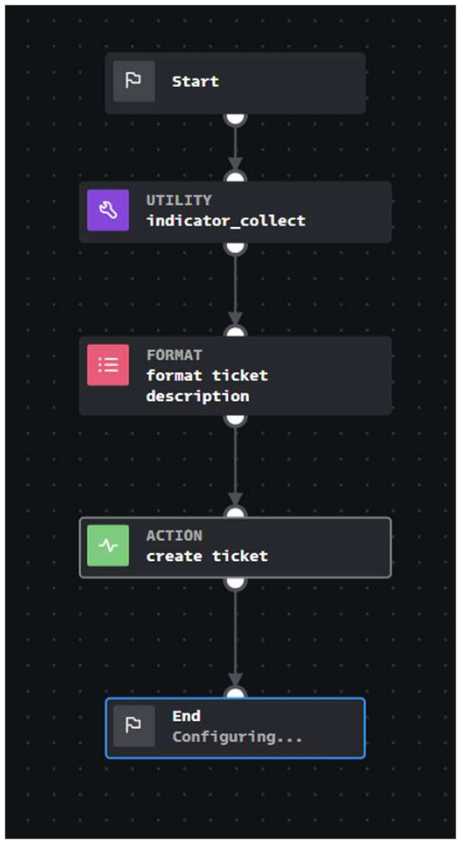
Manual Labelling



AI Integration



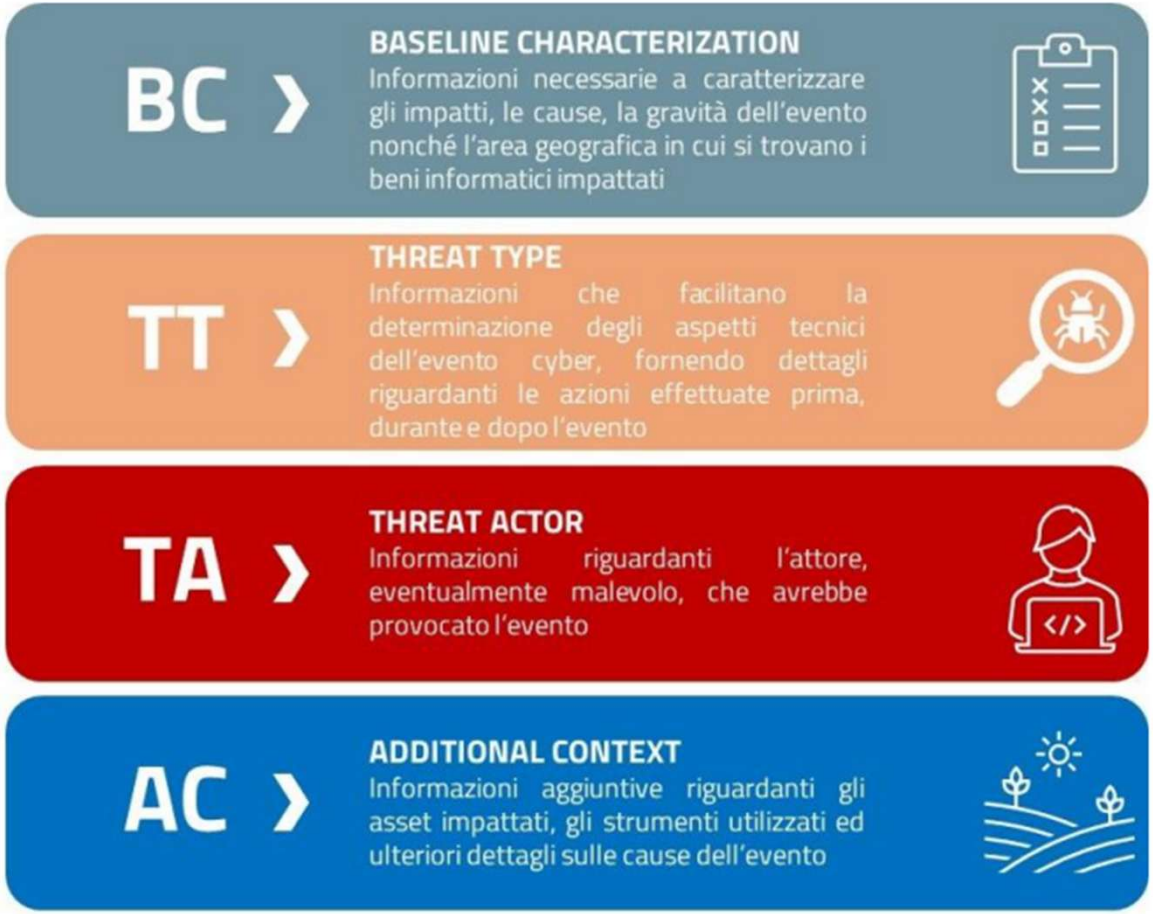
Visual Playbook Editor



Playbooks

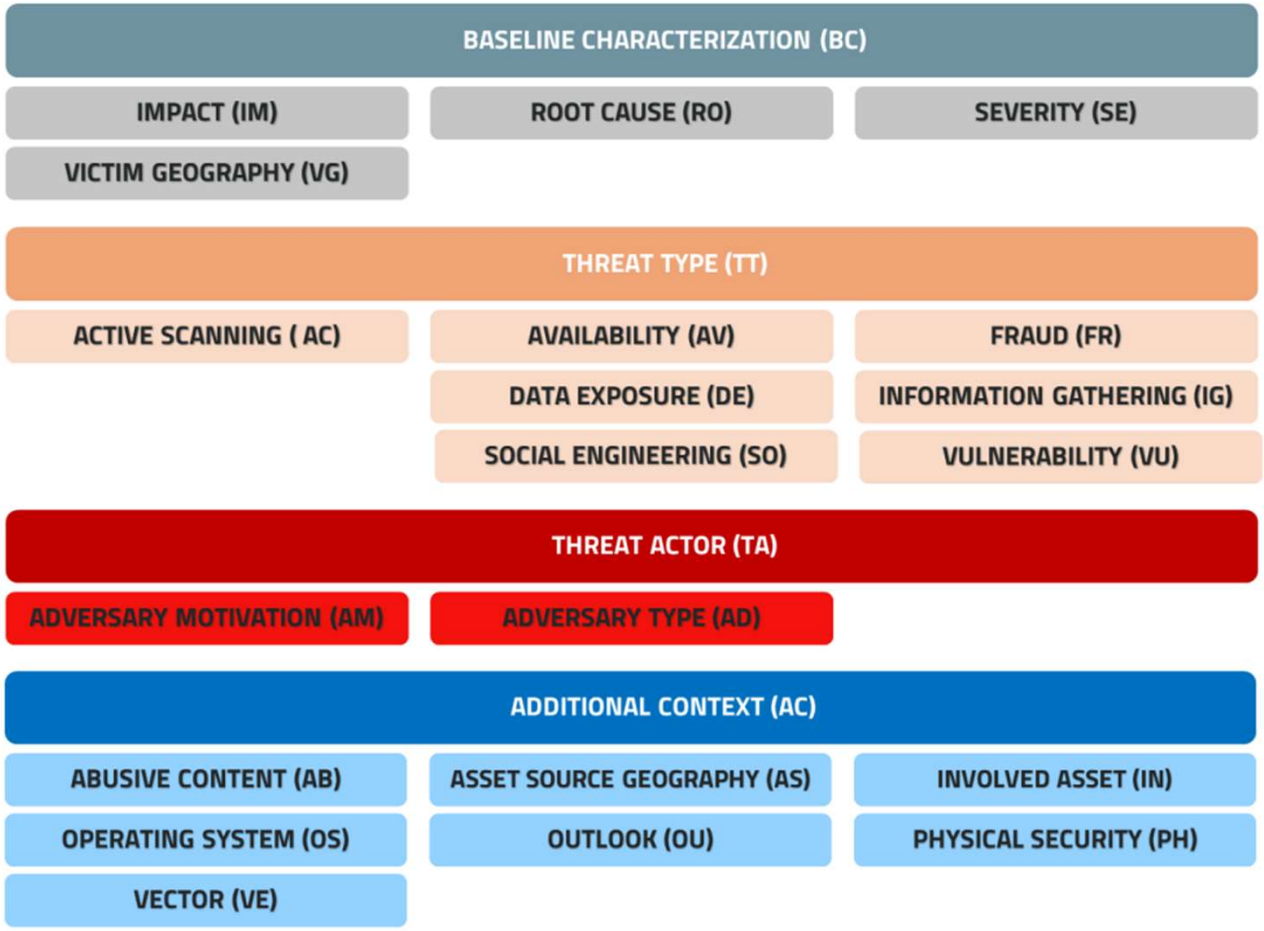
- Phantom Community Playbooks
- Phantom library for Python
- Splunk playbooks: https://research.splunk.com for the Visual Playbook Editor (VPE)
- Phantom Community Playbooks on github: https://github.com/phantomcyber/playbooks (Apache-2.0 license)

Incident reporting according to TC-ACN



https://www.acn.gov.it/portale/documents/d/guest/acn_tassonomia_cyber_clear

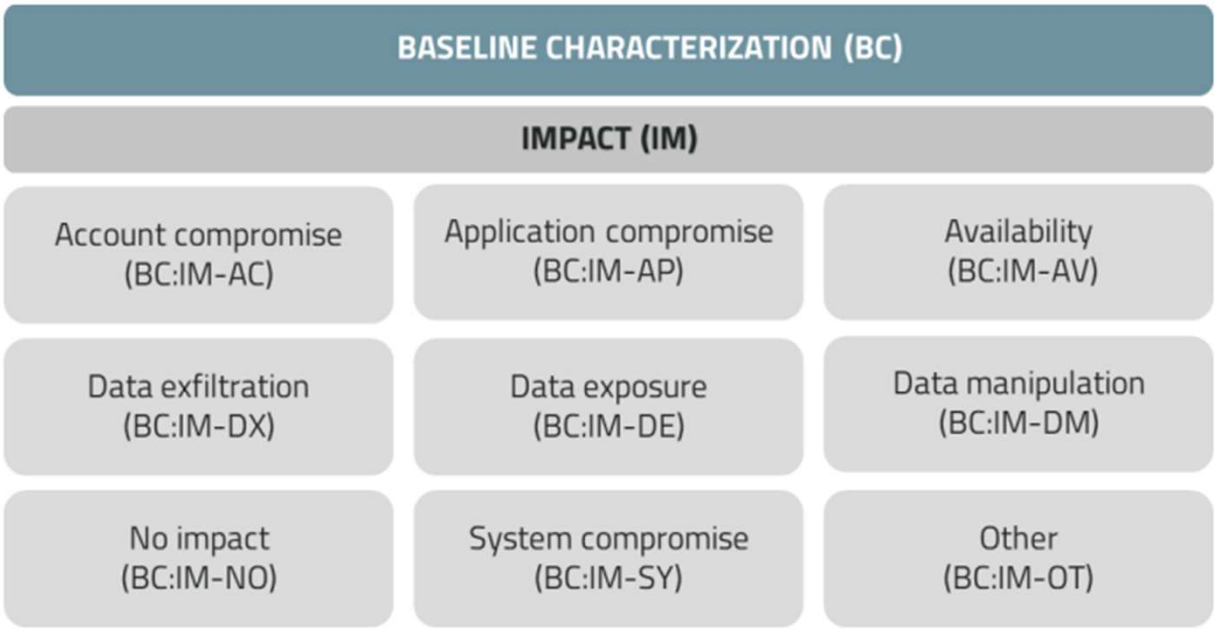
Macrocategories and Predicates



https://www.acn.gov.it/portale/documents/d/guest/acn_tassonomia_cyber_clear

Values

Values for the macrocategory **Baseline Characterization** and the predicate **Impact**:



https://www.acn.gov.it/portale/documents/d/guest/acn_tassonomia_cyber_clear

Example of TC-ACN vector

<BC:IM-DE BC:RO-MA BC:SE-LO BC:VG-EU
TT:DE-PD TT:MA-BA TT:VU-SE TA:AM-ES TA:AD-CR
AC:AB-OT AC:AS-IT AC:IN-OT AC:PH-UN>

→ Impact: Data Exposure

→ Root Cause: Malicious Actions

→ Severity: Low

→ Victim Geography: Europe

→ Data Exposure: Personal data

→ Malicious Code: Backdoor

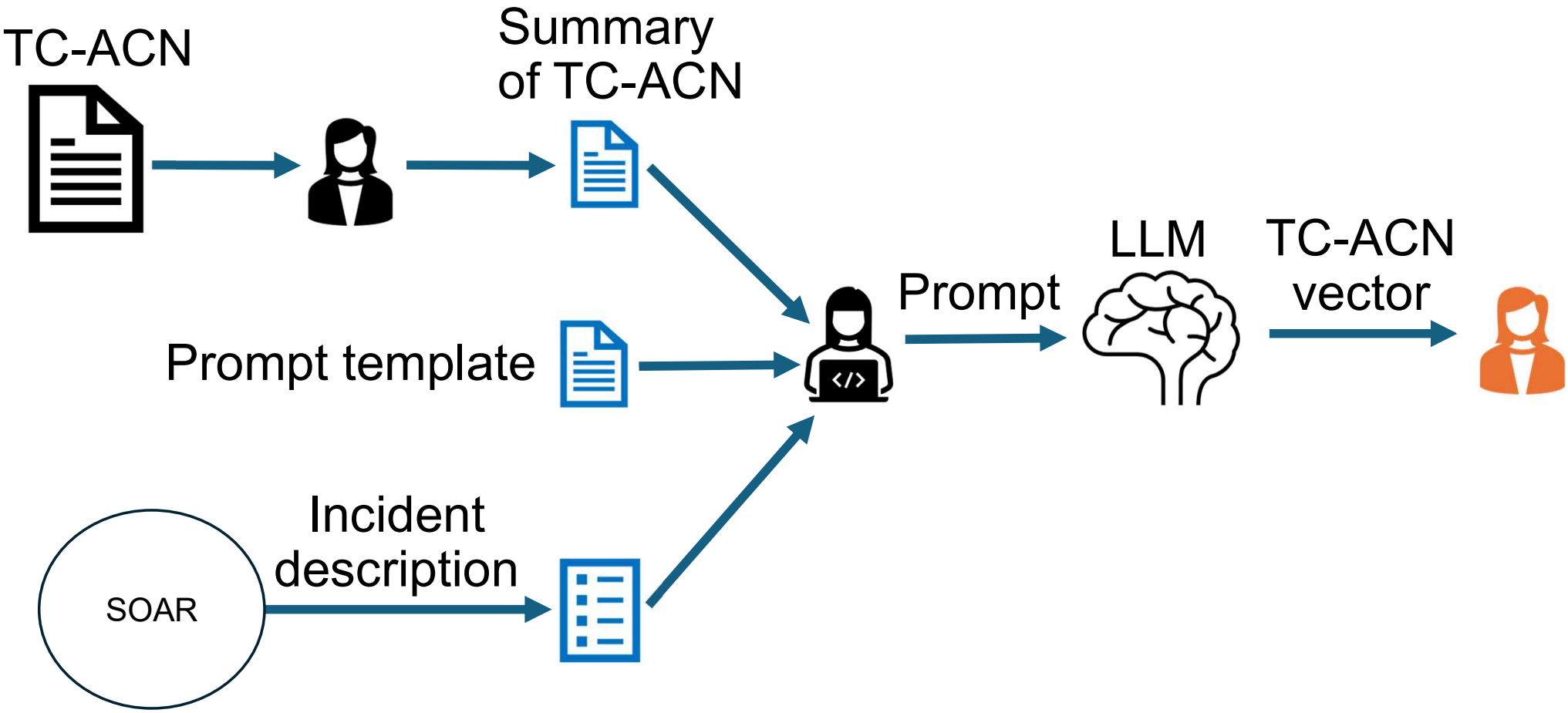
…

MITRE ATT&CK Framework

250 adversary tactics and techniques (https://attack.mitre.org)

https://attack.mitre.org

Methodology



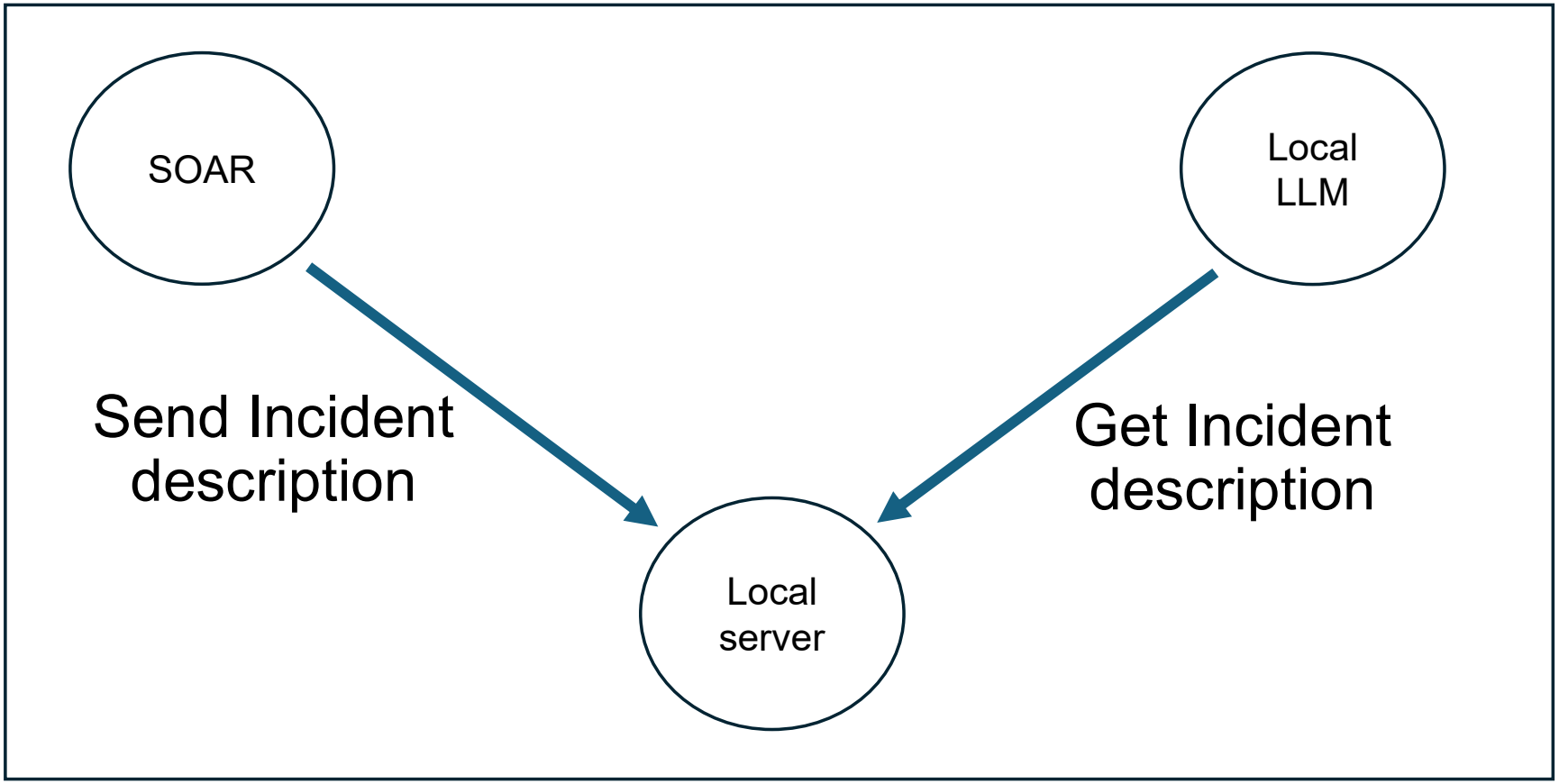
How to generate the prompt

Prompt:

You are part of a SOC team. Your role is the security specialist. Consider the incident description <incident description>. Generate the TC-ACN vector in the correct format according to the definition of the TC-ACN taxonomy <TC-ACN summary>.

Automation

On-premises solution



Preliminary Results

Setup: gpt-oss:20b model, thinking feature, 4k context length

Synthetic data for the incident description

Incident description: „Potential DoS Attack detected“ →

<BC:IM-AV BC:RO-MA BC:SE-ME BC:VG-GL TT:DS-OT AC:AB-OT AC:AS-OT AC:IN-OT AC:PH-OT TA:CY-OT>

Preliminary Results

Setup: gpt-oss:20b model, thinking feature, 4k context length

Synthetic data for the incident description

Incident description: „Web application exploited through SQL injection“ →

<BC:IM-AP BC:RO-MA BC:SE-ME BC:VG-GL TT:VU-OT TA:CY-OT AC:AV-UN AC:TS-WS AC:ET-UN AC:DM-UN AC:RA-UN>

Conclusions

- AI Augmentation to address the problem of FP
  (it needs a ground truth / human feedback)
- Phantom Community Playbooks to test automated responses
  (basic concepts can be applied to different software solutions)
- Brief introduction to TC-ACN
- Leveraging (local) LLMs
- Bias problem → Improving the quality of the TC-ACN summary
- Introducing AI models to replace humans
- Fine-Tuning LLMs with examples

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References and Links

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- Ollama (2025), Ollama models, https://ollama.com/search
- Splunk playbooks (2025): https://research.splunk.com
- Phantom Community Playbooks on github (2025): https://github.com/phantomcyber/playbooks
- MITRE ATT&CK Framework (2025): https://attack.mitre.org

Note: All listed links were last accessed on 02/11/2025.